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## Removal of Undesired Occurrences in Hair and Fur

5 The present invention relates to a method and a device for removing undesired occurrences in hair and fur, the method including use of a mouthpiece with a mouth, the mouthpiece being connected to a source of vacuum through a tube and containing a filter and at least one comb, and the device including a mouthpiece adapted to engage one end of a tube attached to a source of vacuum, the mouthpiece including a mouth and at least one comb attached thereto.

### 10 STATE OF THE ART

The commonly known method of mechanical combating head lice and other vermin in hair and fur is combing with a fine-toothed comb. The treated hair/fur is optionally moistened and flushed with hair conditioner. The hair/fur is combed thoroughly whereby lice and other vermin are attempted caught with the comb in their living area  
15 close to the scalp or skin and then moved out of the hair by the comb. Combing is performed as usual, i.e. stroke by stroke in the entire length of the hair. When lice or vermin have been caught and moved out of the hair sitting in the comb, they are removed from the comb with a brush or with a pointed tool before continuing the combing.

20 The commonly known alternative technique for combating lice and other vermin in hair and fur uses different shampoos, which with a content of poison, e.g. malathion, are intended for killing lice and vermin. The commonly known technique for combating dandruff in head hair uses different dandruff shampoos, e.g. nizoral shampoo.

25 There are a number of publications disclosing prior art similar to that indicated above:  
US Patents:

876766, Jan., 1908, Blaisdell,  
918929, Apr., 1909, Thurman,  
1015894, Jan., 1912, Keller,  
30 1525106, Feb., 1925, Smythe,  
1770749, July, 1930, Engberg et al,  
1859132, May, 1932, Fechtenburg,  
2276886, March, 1942, Smith,

2780829, Feb., 1957, Cohen,  
2953808, Sep., 1960, Carmack,  
4190924, March, 1980, Nicholson,  
4485583, Dec., 1984, Planty,  
5 4799863, Jan., 1989, Gannon,  
5074006, Dec., 1991, Eremita,  
5502873, Apr., 1996, Hogan,  
6086682, July, 2000, Anderson  
and  
10 EP 1036522 A2.

Among these references, the closest prior art is:

15 US 4,485,583 discloses a vacuum cleaner mouthpiece intended for removing fleas from pet fur, where the mouthpiece may be connected to vacuum. The mouthpiece has a relatively flat and wide mouth in front of which a comb may be fastened, so that the teeth of the comb cover the front of the mouth. Inside the mouth is provided a chamber in which a filter bag may be mounted from which retained fleas cannot evade.

20 US 6,086,682 disclose combating lice in humans. Here is described a mouthpiece which may be connected to a vacuum. The mouthpiece has a flat mouth in front of which a comb may be fastened. The teeth on this comb completely cover the mouth and protrudes from the lower edge of the mouth.

25 Both of the above US publications concern supplying vacuum to the traditional combing in order to achieve greater efficiency. One of the central problems of combing with fine-toothed comb in general and combing with fine-toothed comb subjected to suction in particular is the tangling tendency of the hair. This tendency increases with the length of the hair as well as with the power of the suction.

30 By combing long hair it is necessary to solve this problem since combing with fine-toothed comb in long entangled hair is a very cumbersome and practically unfeasible solution. When suction is applied simultaneously, the hair will tangle so that combing

becomes completely impossible. If combing supported with suction is to be a usable method in any case for removing lice and vermin, a solution to this problem is to be presupposed as lice and vermin are primarily a problem in long hair.

- 5 If long hair is bent into the suction during combing, it tangles immediately unless the suction power is reduced to a level where the hair is not sucked with, which will not be efficient in relation to removing lice and other vermin.

US 4,485,583 and US 6,086,682 do not consider the problem of tangling.

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- EP 1036522 A2 describes combating lice on humans by using a mouthpiece that may be coupled to a source of vacuum. The mouthpiece is shaped as a round tube with closed end, where the mouth is a longitudinal, elongated and oval slot. A row of comb teeth or brushes are disposed adjacent to both sides of this mouth. The slot mouth is covered by a fine mesh, and behind the suction slot, in another, transverse slot, a filter may be inserted.

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- In EP 1036522 A2, the problem is countered by a fine mesh covering the suction opening. This partly solves the tangling problem, but in the solutions provided according to the invention, an efficient suction force will be difficult to achieve, since there will be great loss of suction power due to the positioning of comb teeth/brushes at the mouth simultaneously with lice and vermin are to be sucked through the thick layer of hair, which is tightly tangled by itself and through the mentioned fine mesh that continually has to be cleaned from fluff and loose hairs. The filter inside the mouthpiece will also mean loss of suction power.

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- Lice hold on very well so that strong suction is required. If the suction from a usual vacuum cleaner is directed toward a spotted louse so that the scalp bulges markedly into the suction mouth, repeated mechanical interferences are needed in addition before this louse is forced to let go. If suction of the power here mentioned may be attained directly on the scalp, tangling problems would occur, as the hair will be caught in a greater area by the suction force and pulled and bent against the comb.

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US 5,768,748 discloses a suction mouthpiece used for combing hair and fur in order to remove lice and fleas. The mouthpiece comprises a detachable comb positioned at an angle relative to the mouth of the mouthpiece. The mouthpiece has a sharp bend, and downstream of the bend in the direction of the air stream, the mouthpiece contains a restriction element in the shape of a spherical restriction element filling out a large part of the flow cross-section of the mouthpiece. Behind the restriction element and in connection with a transition to a hose, a filter is provided.

The invention described in US 5,768,748 is unsuitable in that during use the engagement in the animal's fur of the comb cannot be seen. By letting the mouthpiece fit tightly, a strong underpressure, which may be unpleasant, may arise in the mouthpiece, why a valve is provided in the mouthpiece so that pressure relief may be provided. The opening of the valve will interact with the spherical restriction element, and a reduced underpressure may be formed in the mouthpiece. The bend of the mouthpiece and the provision of the spherical restriction element, respectively, mean that the mouthpiece is unsuited for treating humans. Particularly persons with long hair will achieve a total entangling of the hair at the bend, and matting around the spherical element will be unavoidable. Another important problem in treating people is the existence of strong suction which will be unpleasant. As the comb is hidden, the person performing treatment will almost work heedlessly.

The efficiency of the fine-toothed combing and the shampoo methods on combating lice is examined more closely by R J Roberts, D Casey, D A Morgan and M Petrovic, and the examination is titled *Comparison of Wet Combing with Malathion for Treatment of Head Lice in the UK: a Pragmatic Randomised Controlled Trial*, published in the distinguished medical journal The Lancet, 12 August 2000.

The conclusion of the examination is that the technique with fine-toothed comb and balsam has a recovery rate of about 50% and the malathion shampoo about 78%. But since only 50% of the participants in the test completed, it hardly gives a complete picture of the efficiency of the treating method. Apparently there is a human factor in the treatment playing a large role.

## SUMMARY OF THE INVENTION

An object of the present invention is to improve fine-tooth combing and to provide a suitable device so that the method and the use of the device become rapid, convenient and 100% efficient methods for removing lice and other vermin as well as dandruff.

5 Another object of the invention is to avoid shampoos with a poisonous content to which the lice have developed a certain resistance, shampoos which Danish National Board of Health deprecate pregnant women and babies up to three years to use except by indication from a doctor.

10 The task may be solved by method in which the mouthpiece has a longitudinal, inclining mouth, where the comb is fastened to the front end of the mouth and has a steep angle relative to the longitudinal axis of the mouthpiece, the comb covering a minor part of the mouth of the mouthpiece, and where a sheaf of hair is sucked into the mouth whereby the sheaf of hair is hanging extended in the mouthpiece, where the  
15 comb is tilted in over the sheaf of hair with an edge of points of teeth of the comb is in contact with scalp or skin on which the hair is growing, where the sheaf of hair is combed by pulling the comb with the edge of the teeth in contact with the scalp or skin through the sheaf of hair, after which the comb is tilted out of the sheaf of hair, where the process including the above steps is repeated for the sheaf of hair, causing unde-  
20 sired occurrences to be detached and sucked through the mouthpiece in order subsequently to be caught by the filter in the mouthpiece.

Hereby may be achieved that lice, dandruff and vermin are no longer lost from the comb, neither in the hair nor in the surroundings from where lice and vermin may get  
25 back to their habitat area. The just newly hatched lice, the nymphs, which are almost impossible to catch with a fine-toothed comb, are now easily caught. Lice and vermin are no longer to be caught by and in the comb and combed out of the hair along the entire length of the hair. The invention implies that the treatment time is more than halved and at the same time the efficiency is more than doubled. By careful systematic  
30 treatment, the efficiency is improved up to 100%. The cleaning of the comb when lice and vermin are caught is now effected automatically and continually. The random element by traditional methods of treatment with fine-toothed comb is obviated by the present invention. At the same time, problems with tangling of the hair during the

treatment are solved. Compared with shampoo treatment, there is attained shorter treating time where the treatment is far more comfortable and simultaneously implying far greater efficiency. The poisonless treatment removes any risk of poisoning while at the same time the treatment maybe performed with less environmental impact. Also, a  
5 cheaper treating method is achieved.

Advantageously, the method may be repeated for different hair sheaves for completing the process. Hereby a person or an animal may be cleaned effectively.

10 Advantageously, the comb may be tilted freely in and out of the said sheaf simultaneously with combing with short strokes, where the edge of points of teeth in each combing movement is drawn over the scalp through the habitat area of the lice and vermin, and where the same area of the scalp is combed with short intervals. Hereby  
15 may be achieved that repeated interferences under strong suction action makes it still more difficult for lice to hold fast, and after 2-4 combings the lice are eventually detached.

The invention also concerns a device of removing undesired occurrences in hair and fur, where the mouthpiece has a substantially elongated shape, where the mouth of the  
20 mouthpiece is arranged longitudinally inclining, forming a first angle relative to the longitudinal axis of the mouthpiece, where the comb is arranged to form a second angle relative to the longitudinal axis of the mouthpiece, and where the comb covers less than half of the mouth of the mouthpiece.

25 Hereby may be achieved that hair is sucked into the apparatus, and, if the hair is long enough, further into the connecting pipe and hose of the vacuum source, e.g. a vacuum cleaner, where the length of the hose in principle limits the length of the hair which may be treated immediately, as the hair according to the invention is to be sucked in straight and be suspended straight in the vacuum. As the hair, including particularly  
30 long hair providing the greatest difficulty in combating lice and vermin, may be sucked into the mouthpiece under the comb, it is achieved that the hair is kept straight and still flexible by the suction, thus establishing a hold on the hair that provide it does not tangle during the combing. The mentioned hold in the hair opens possibility of

supplying the technique a new way of combing, as the comb does not have to be drawn in the entire length of the hair, so that a comb stroke is always finished at the hair ends. A process which almost unavoidably leads to tangling in the hair when at the same time there is sucked with a power effectively removing lice and vermin. A far more efficient and rapid rhythmical combing of the scalp right at the living place of lice and vermin is now possible. Since there is now hold in the hair in a way so that it can neither tangle nor become too live or electrical, the comb may be tilted out of and in to the hair at will. The combing may therefore be performed with short strokes so that the comb may return to the same area of the scalp with short intervals. This has great significance for the efficiency of the treatment as particularly lice, as mentioned above, may hold fast, even though they are directly disturbed, at the same time as they are subjected to a very strong suction, however so that repeated interferences under strong suction makes it still more difficult, eventually detaching the louse after 2-4 combings. Therefore, it is important that the louse is not given the time needed for settling between the combings. According to the invention, the hair is "opened" by the suction so that lice, vermin and dandruff are conducted away unimpeded when only they are detached, and besides, are also much more easily detached when the individual hairs are risen and opened by the suction. The suction also causes the hair in pipe or hose to flutter in the airstream. The flutter of the hair implies that the individual hairs knock against each other. This impedes lice or fleas caught by the suction to be given opportunity to settle in the hair and subsequently go back to the scalp of the treated person. The flutter of the hair may imply vibrations in the teeth of the comb, increasing the efficiency of the treatment as the vibrating teeth cause further stressing of the lice, whereby the lice let go of their habitat more rapidly.

The mouth below the edge of the tooth points on the comb may incline backwards. Hereby may be achieved that the full suction power from the vacuum cleaner is concentrated optimally in the tooth interspaces on the relatively small comb when combing is performed, and it is achieved that the comb not only, according to tradition, is to catch lice and vermin, but only, in cooperation with the suction action, is to disturb sufficiently in order for the suction to remove lice and vermin subsequently.

Advantageously, the device includes a filter having shape of a cone in the edge of which there are a number of slits, where the filter is placed in the mouth of the connecting tube for the vacuum source, so that the filter edge is turned about the edge of the vacuum connecting tube, where it is retained by the connecting tube of the mouth-  
5 piece when the former is put on, and so that the said filter is easily detached from the point as this is visible in the connecting tube of the mouthpiece when the connecting tubes are separated. Hereby may be achieved that all which is removed from the hair is caught by the filter. After treatment, one may see the direct result, and possible living organisms may be disposed of so that renewed spreading may be avoided.

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The device may be shaped as a mouthpiece having a mouth, where the mouthpiece may contain a comb that is readily detachable, and where the comb may be disposed uppermost in the mouth, the comb covering a relatively small area of the total area of the mouth, so that the mouthpiece under the comb presents a relatively large and open  
15 mouth. Hereby is provided an exchangeable comb which may be an advantage if more persons are to be treated at the same time, because otherwise one is required to clean each comb before using on the next person. Another advantage is that the comb may be replaced if worn or damaged.

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The mouth may be essentially circular as seen from the front, where the comb fits tightly to the adjacent edge of the mouth and extends in a plane substantially perpendicular to the longitudinal axis of the device. Hereby may be achieved that the comb is placed transversely to the suction, with tooth points relatively perpendicular to the sheaf of hair sucked into the apparatus. Hereby, the comb becomes easy to use in  
25 combing.

The mouth may incline rearwards and backwards from the edge of the tooth points. Hereby may be achieved an area below the comb which is free, where the comb may be used for combing the hair close to the scalp.

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At opposite sides of the mouth, the mouthpiece may have a bulge providing a tilt axis and simultaneously forming a support for combing.



The device may include a first filter provided in association with the device and attached readily detachable, where the filter is shaped as a cone with slits along the edge. Thereby is achieved that a disposable filter may be used which can be disposed after final treatment.

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The device according to the invention may be provided with a further filter disposed upstream relative to the other filter, the further filter being readily detachable, shaped a cone, and provided with a hole at the bottom. Thus may be achieved a permanent filter for carrying the detachable filter, thus enabling to make the replaceable filter as a thin and cheap filter supported by an underlying supporting filter.

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In an alternative embodiment of a filter, it may be disposed at a transition between a tube and a pipe, where the transition is formed by a locking mechanism providing access to the filter after unlocking, where the filter is formed by a filter cylinder interacting with the internal wall of the pipe and containing a bottom formed by a filter. Hereby may be achieved that a filter is placed in connection with an existing joint between components, where the filter forms an insert which is easy to exchange. After use, the filter bottom will contain the catch obtained by the treatment. The catch may consist of lice, fleas and dandruff.

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Advantageously, the filter may be closed by a cover when underpressure is present behind the filter, where the cover includes an end piece and a cylinder, where the cylinder of the cover engages the internal wall of the filter cylinder. Hereby is achieved an efficient incarceration of fleas without they having any possibility of evading. Particularly cat fleas may otherwise evade with great agility.

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The end piece may be formed by a lens for watching the contents of the filter, and where the focus of the lens may be adjusted by more or less pressing the cylinder of the cover. Appreciable aid in viewing the vermin or dandruff caught in the treatment may hereby be achieved.

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A possible embodiment of the lens is shaping the lens as a Fresnel lens. Thus may be achieved a thin and flat lens where refraction of light occurs by means of triangular grooves.

## 5 THE DRAWING WITH EMBODIMENTS

The invention is now described in more detail below with reference to the accompanying drawings.

10 Fig. 1 shows a person during treatment by means of a mouthpiece 1, which is connected to vacuum, where the mouthpiece includes a readily detached comb 2 fitted in the mouthpiece 1. The mouthpiece communicates with a flexible vacuum cleaner hose 3 through a flexible connecting tube 4, which is connected to a usual vacuum cleaner pipe 5 having an angle with connection to a vacuum cleaner 6.

15 A tuft of hair 7 held straight and tight in the vacuum during combing is sucked into the mouthpiece 1 by the vacuum, while the mouthpiece 1 combs hair and scalp with the comb 2, and where repeated combing loosens lice and dandruff.

20 Fig. 2 shows a detailed view of the invention with a mouthpiece 21 provided with a comb 22 that may be detachably mounted in the mouthpiece 21, which is connected to a flexible hose or tube 23 provided with a connecting stub 24 for further connection with a connecting pipe 25 of a vacuum cleaner or other source of vacuum.

25 Fig. 3 shows a possible embodiment of the invention in detail. A mouthpiece 31 contains a comb 32. The mouthpiece 31 is connected to a hose 33 which at the opposite end is connected with a conical pipe stub 34 to be connected with a vacuum cleaner with a connecting means 35, which may be formed with internal thread. The comb 32 has tooth points surrounded by support and bulges 39 acting as tilt axis at both sides of the mouthpiece 31.

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Fig. 4 shows the embodiment of Fig. 3 as seen from the front with the comb 32 and support and bulges/tilt axis 39.

Fig. 5 shows the comb 32 when dismounted from the mouthpiece 31.

Figs. 6 - 13 show a possible embodiment of a filter 41 in 6 functional stages.

5 Fig. 6 shows how the filter 41 is placed in a vacuum connecting tube 45. The filter 41 is made with slits 42.

Fig. 7 shows filter fitted in vacuum in connecting tube 47 which has a conical connecting stub.

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Fig. 8 shows that the filter 41 is turned down at the slits 42 as the tubes are telescoped together whereby a creasing of the filter 41 occurs.

15 Fig. 9 shows the conical tube 47 slid down over the vacuum connecting tube 45, thereby securing the filter 41 in direction 43 of the airstream with possibility of collecting particles/vermin 46 in the air stream. Collected lice or other particles are shown as 48.

20 Fig. 10 shows the tube when separated for removing the filter 41 placed on the connecting stub of the mouthpiece.

Fig. 11 shows removal of the filter 41 with a grip in the point 49 now visible.

25 Fig. 12 shows a perspective view of the filter 41 after use.

Fig. 13 shows a possible version of the filter 51 with an internal filter 52 with a hole in the bottom 53 acting as a trap 54. Thereby is obtained a flea filter 55.

30 Fig. 14 shows a possible version of the invention with a decorative mouthpiece 61 as seen from the side with a comb 62 surrounded at both sides by a support/tilt axis 69 where the mouthpiece 61 has decorative eyes/attachment 63 for the comb 62 in the mouthpiece 61. The mouthpiece has a connection 64 for connection of vacuum.

Fig. 15 shows the mouthpiece in Fig. 14 as seen from the front with the comb 62 and support/tilt axis 69.

Fig. 16 shows the comb 62 separated from the mouthpiece 61.

5 Fig. 17 shows a perspective view of the embodiment shown in fig. 14 and 15.

Fig. 18 shows a section through a possible embodiment of a mouthpiece 71 having a comb 72 mounted in a comb attachment 73 provided with decorative eyes, and where a flexible tube 75 is shown inside the mouthpiece 71. The flexible tube 75 contains a  
10 filter 78 which is mounted in the end of the flexible tube opposite to the mouth, where the flexible tube has a ring 76 containing a fold/flange/edge 74 at which the filter is fastened by means of a clip 77.

Fig. 19 shows the flexible tube 75 with ring 76 with internal flange 76 for fastening  
15 filter 78 by means of clip 77. Hereby is achieved an alternative filter for internal mounting in a connecting tube for a vacuum cleaner.

Fig. 20 shows an alternative embodiment of a louse snatcher 100 consisting of a mouthpiece 102 to which is fastened a comb 104 by means of a comb attachment 106.  
20 The comb 104 covers a part of a mouth 108 in the mouthpiece 102. The mouth of the mouthpiece has an inclining wall 110 surrounding the open part of mouth 108, whereas a wall 112 with second angle relative to the mouthpiece 102 surrounds the part of the front of the louse snatcher, where the comb 104 is attached. The mouthpiece 102 is terminated with a flange 114 to which is fastened a hose 116. The hose  
25 116 is secured by a connection 118 with a lock piece interacting with a connection 120 provided with a lock 122. Connection 120 interacts with a connecting tube 124 of a usual vacuum cleaner.

On Fig. 21 is shown a detailed view of a connection 118 and connection 120, shown  
30 here in a disassembled condition, whereby access is provided to an internally disposed filter 130 consisting of a filter membrane 131 and a cylinder 132, where the filter has an opening 134. During operation, the filter 130 is provided internally in the connection 120.

Fig. 22 shows the filter 130 with the wall 132 and the opening 134. Above the filter is shown a filter cover consisting of a transparent cylinder 128 with an end piece in the form of a lens 140.

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When the filter is removed from the connection 120, the cover with the transparent wall 138 and the lens 140 may be disposed inside the opening 134 in the filter, whereby possible catch of lice or fleas may be viewed through the lens 140. The depth at which the cover 138 is pressed down into the filter determines the focusing of the lens 140.

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Fig. 23 also shows an embodiment of a filter consisting of a wall 130 and an opening 134, where the opening 134 is closed with a cover consisting of a transparent wall 138 and a lens 140.

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Fig. 24 shows a filter consisting of a filter bottom 131, a wall 132 with filter cover inserted with a wall 138 and a lens 140. Inside the filter is outlined the catch that may be obtained by a treatment, the catch possibly consisting of lice, fleas, and dandruff or other alien animals or particles that have ended up in the hair.

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The present invention may remove lice and vermin quickly and 100% efficiently in short as well as long hair. The treatment is not uncomfortable. Correctly performed, it may be described as a comfortable, cool massage of the scalp.

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The treatment is also suited for removing dandruff such as already being loose in the hair as well as dandruff that is released by the thorough massage of the scalp by the comb. After treatment at least 3-4 days pass before dandruff will sprinkle out of the hair again. The treatment temporarily removes the itch in the scalp caused by dandruff.

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The filter provides easy viewing of the result of the treatment which has both psychological and practical meaning. Practical meaning is with regard to lice as lice appear in four sizes. Since their shell cannot grow, they leave it three times in their lifetime. Only the largest lice (about 3 mm long) are egg-laying, and they lay 5-8 eggs a day. If

large lice are caught, this naturally indicates that eggs are present in the hair, why one has to count on one more treatment when these eggs are hatched 6-9 days later, and a easier check treatment subsequently. If no large lice are found after thorough treatment, one is near having cleaned the hair so that the treatment can be finished with an easier post check. If no lice are caught, the attack is presumably finished. The filter enables quick and efficient louse checks, and if lice are found, one may turn to thorough treatment right away.